CLAIMS

What is claimed is:

1. A superabrasive wire saw, comprising a wire and a superabrasive layer having a plurality of individual coated superabrasive particles attached to the wire with an organic binder, said coated superabrasive particles comprising a superabrasive particle and a solidified coating of a molten braze alloy chemically bonded to the superabrasive particle.

2. The superabrasive wire saw of claim 1, wherein the superabrasive layer is substantially continuous.

3. The superabrasive wire saw of claim 1, wherein the superabrasive layer is discontinuous having a plurality of abrasive segments.

4. The superabrasive wire saw of claim 1, wherein the superabrasive particle is diamond.

5. The superabrasive wire saw of claim 1, wherein the superabrasive particle is cBN.

6. The superabrasive wire saw of claim 1, wherein the solidified coating is from about 1 μm to about 10 μm in thickness.

7. The superabrasive wire saw of claim 1, wherein the wire comprises a member selected from the group consisting of steel, tungsten, and copper.

8. The superabrasive wire saw of claim 1, wherein the wire has a diameter of from about 0.1 mm to about 10 mm.

9. The superabrasive wire saw of claim 8, wherein the wire has a diameter of from about 0.1 mm to about 0.2 mm.

10. The superabrasive wire saw of claim 8, wherein the coated superabrasive particle has a diameter about $1/5^{th}$ to about $1/3^{rd}$ the diameter of the wire.

11. The superabrasive wire saw of claim 1, wherein the braze alloy contains at least about 1% of a reactive element selected from the group consisting of Al, B, Cr, Li, Mg,

Mo, Mn, Nb, Si, Ta, Ti, V, W, Zr, and mixtures thereof.

12. The superabrasive wire saw of claim 11, wherein the reactive element is Cr.

13. The superabrasive wire saw of claim 11, wherein the reactive element is Ti.

14. The superabrasive wire saw of claim 1, wherein the organic bindercomprises a member selected from the group consisting of epoxy resin, phenolic resin, polyimide resin, and mixtures thereof.

15. The superabrasive wire saw of claim 1, wherein the organic binder further comprises an organometallic coupling agent.

16. The superabrasive wire saw of claim 1, wherein the organic binder further comprises a filler.

17. A method of forming a superabrasive wire saw, comprising the steps of:

a) coating superabrasive particles with a braze alloy in a molten liquid state and solidifying the braze alloy around the superabrasive particle, such that the braze alloy becomes chemically bonded with the superabrasive particle to form coated superabrasive particles;

b) forming a mixture of coated superabrasive particles and organic binder over at least a portion of a wire; and

c) curing the organic binder to secure the coated superabrasive particles to the wire to form a superabrasive wire saw.

18. The method of claim 17, wherein the coated superabrasive particles have an average surface roughness of from about 3 μm to about 10 μm.

19. The method of claim 17, wherein the steps of coating the superabrasive particles, forming a mixture, and curing the organic binder are performed continuously as the wire is drawn through a processing area.

20. The method of claim 17, further comprising the step of removing portions of the mixture from the wire to form discontinuous segments.

21. The method of claim 17, wherein the coated superabrasive particles are in a single layer.

22. The method of claim 17, wherein the braze alloy contains at least about 1% of a reactive element selected from the group consisting of Al, B, Cr, Li, Mg, Mo, Mn, Nb, Si, Ta, Ti, V, W, Zr, and mixtures thereof.

23. The method of claim 22, wherein the reactive element is Cr or Ti.

24. The method of claim 17, wherein the step of coating further comprises the steps of:

a) covering the superabrasive particle with a binder material;

b) adhering a powdered form of braze alloy to the superabrasive particle with the binder material; and

c) heating the braze alloy to a temperature sufficient to cause the alloy to melt and coat and chemically bond to the superabrasive particle.

25. The method of claim 24, wherein a plurality of superabrasive particles are coated simultaneously, and wherein prior to the step of heating, the method further comprises the steps of:

a) distributing the superabrasive particles in a separator that allows separation of the particles during heating;

b) heating the braze alloy to a temperature sufficient to cause the alloy to melt and coat and chemically bond to the superabrasive particle; and

c) removing the individually coated superabrasive particles from the separator.

26. The method of claim 25, wherein the separator is a powder which is non-reactive with the reactive metal alloy.

27. The method of claim 26, wherein the non-reactive powder is either an oxide powder, or a nitride powder.

28. The method of claim 17, wherein the step of coating is preceded by the step of

forming a layer of a material selected from the group consisting of Cr, Si, Ti, and W on the superabrasive particle.

29. The method of claim 17, wherein at least about 40% of the superabrasive particle surface is wetted by the molten braze alloy.

30. The method of claim 17, wherein the braze alloy has a melting temperature below a thermal stability limit of the superabrasive particle.

31. A method of forming a superabrasive wire saw, comprising the steps of:

a) coating superabrasive particles with a braze alloy in a molten liquid state and solidifying the braze alloy around the superabrasive particle, such that the braze alloy becomes chemically bonded with the superabrasive particle to form coated superabrasive particles having an average surface roughness of from about 3 μm to about 10 μm, said braze alloy has a melting temperature below a thermal stability limit of the superabrasive particle and contains at least about 1% of a reactive element selected from the group consisting of Al, B, Cr, Li, Mg, Mo, Mn, Nb, Si, Ta, Ti, V, W, Zr, and mixtures thereof and wetsat least about 40% of the superabrasive particle surface;

b) forming a mixture of coated superabrasive particles and organic binder over at least a portion of a metal wire, such that the coated superabrasive partides are in a single layer; and

c) curing the organic binder to secure the coated superabrasive particles to the metal wire to form a superabrasive wire saw;

wherein the steps of coating the superabrasive particles, forming a mixture, and curing the organic binder are performed continuously as the metal wire is translated through a processing area.